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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,334	08/01/2003	Maxwell W. Lippitt III	Buckfeller 13-2-2-3/07590	4192
29391	7590	09/21/2004	EXAMINER BREWSTER, WILLIAM M	
BEUSSE BROWNLEE WOLTER MORA & MAIRE, P. A. 390 NORTH ORANGE AVENUE SUITE 2500 ORLANDO, FL 32801			ART UNIT 2823	PAPER NUMBER

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/633,334

Applicant(s)

LIPPITT ET AL.

Examiner

William M. Brewster

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-12, 14-16, 18, 25-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al., U.S. Patent No. 6,660,622 B2.

Chen anticipates a method and apparatus for depositing a target material on a semiconductor wafer, in fig. 4, wherein the wafer 12 comprises a first material layer, an overlying second material layer 16 and a plurality of openings 18, and plurality, col. 1, lines 31-37, in the second material layer extending to the first material layer, the method comprising:

providing a target comprising the target material, sputtering target material particles from a target, col. 4, lines 3-14; controlling power supplied to the target to maintain the wafer temperature below a critical temperature, wherein at a wafer temperature above the critical temperature the material of the first material layer can extrude into one or more of the plurality of openings, demonstrated in figure 4; positioning the wafer below the target, not shown;

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sputtering target material particles in response to impinging particles directed

toward the target, col. 4, lines 3-14;

forming a plasma of ionized target material particles from the sputtered target

material particles between the target and the wafer, col. 4, lines 15-25;

supplying power to the wafer to attract the ionized target material particles to the

wafer and depositing the ionized target material particles on the wafer, col. 4, lines 3-14,

and depositing the target material particles on the wafer 40, col. 5, lines 21-34;

limitations from claims 2, 26, the method wherein the step of supplying power to

the target further comprises increasing the power supplied to the target to

increase a deposition rate of target material particles on the wafer, col. 4, lines 3-

14, col. 5, lines 21-34;

limitations from claims 3, 8, 27, the method wherein the material comprising the

target is selected from between titanium and tantalum, col. 6, line 55 - col. 7, line

16;

limitations from claims 4, 28, the method wherein one or more of the plurality of

openings comprise high aspect ratio openings, col. 8, lines 5-8;

limitations from claims 6, 7, the method wherein the step of supplying power to

the target further comprises increasing the power supplied to the target to

increase a deposition rate of ionized target material particles on the wafer,

wherein the step of supplying power to the target further comprises increasing

the power supplied to the target to increase a density of the impinging particles,

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col. 4, lines 3-14, col. 5, lines 21-34, wherein the increased power increases acceleration and thus the rate and density of the particles;

limitations from claim 9, the method wherein the particles impinging the target comprise argon ions, col. 4, line 59 - col. 5, line 20;

limitations from claims 10, 11, the method wherein the step of supplying power to the target further comprises increasing the power supplied to the target to increase a velocity of the argon ions; the method wherein the step of supplying power to the target further comprises increasing the power supplied to the target to increase a density of the argon ions, col. 4, line 59 - col. 5, line 20;

limitations from claim 12, the method further comprising forming a magnetic field to confine the argon ions in a region proximate the target, col. 4, lines 25-48;

limitations from claim 14, the method of claim 13 further comprising increasing the radio frequency power to increase a number of ionized target material particles, col. 4, lines 3-14;

limitations from claim 15, the method wherein the material is deposited on a bottom surface, col. 5, lines 21-33, of the plurality of openings, 1, lines 25-37;

limitations from claim 16, the method of wherein one or more of the plurality of openings comprise high aspect ratio openings, col. 8, lines 5-6;

limitations from claim 18, the method wherein the step of supplying power to the wafer further comprises supplying radio frequency power to the wafer, through the wafer chuck, col. 4, lines 3-14.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 19-24 are rejected under 35 U.S.C. 102(b) as being anticipated by
Gopalraja et al., U.S. Patent No. 6,193,855 B1.

Gopalraja anticipates, in fig. 3, a method for controlling a physical vapor deposition process for depositing material from a target 104 onto a semiconductor wafer 110 comprising: a plurality of features and positioned below the target, the method comprising:

in fig. 1, forming an electric field, labeled E arrow, in a region of the target;

directing particles M+, toward the target;

sputtering target material from the target in response to the particles;

forming a plasma between the target and the wafer, wherein the sputtered target material is ionized by the plasma to form ionized target material;

supplying radio frequency power to the wafer for attracting the ionized target material to the wafer, col. 5, lines 1-18;

depositing the ionized target material on the wafer and

controlling the electric field to maintain the wafer temperature below a critical

temperature, above which wafer features can sustain damage, col. 1, lines 31-62, col. 5, lines 19-57;

limitations from claim 20, the method wherein the step of forming the electric field further comprises controlling the electric field to increase the velocity of the particles directed toward the target to effect an increase in an amount of sputtered target material, col. 1, lines 49-50;

limitations from claim 21, the method of wherein the step of directing particles further comprises introducing argon molecules, ionizing the argon molecules to form a plasma of argon ions in a region of the target, and attracting the argon plasma to the target, col. 1, lines 53-62;

limitations from claim 22, the method of claim 19 wherein the step of forming the electric field further comprises controlling the electric field to increase an amount of sputtered target material, col. 1, lines 45-62;

limitations from claim 23, the method wherein the step of forming the electric field further comprises controlling the electric field to increase a rate at which ionized target material is deposited on the wafer, col. 1. lines 45-62;

limitations from claim 24, the method of wherein the step of forming the electric field further comprises controlling the electric field to reduce the wafer temperature during the step of depositing the ionized target material on the wafer, application of power, col. 1, lines 31-62.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13, 17, 29, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen as applied to claims 1-12, 14-16, 18, 25-28 above, and further in view of Gopalraja et al., U.S. Patent No. 6,193,855 B1.

Chen does not specify using a coil in the chamber, but Gopalraja does. Gopalraja teaches limitations from claim 13, the method wherein, in fig. 3, the step of forming the plasma further comprises providing radio frequency power to a coil 122 positioned between the target 104 and the wafer 102, and wherein the target material particles pass through the coil, col. 4, lines 26-68; limitations from claim 17, the method wherein the step of supplying power to the target further comprises supplying power to the target to increase an intensity of an electric field formed by the power supplied to the target, col. 1, lines 31-62; limitations from claim 30, in fig. 3, further comprising a power source 132 for biasing the wafer to attract the target material plasma to the wafer. Chen gives motivation in col. 2, lines 64-69. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Gopalraja's process with Chen's invention would have been beneficial because the invention achieves good bottom coverage.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 571-272-1854. The examiner can normally be reached on Full Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

William M. Brewster

15 September 2004
WB